

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference WOP0227	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB 03/05384	International filing date (day/month/year) 10.12.2003	Priority date (day/month/year) 21.12.2002
International Patent Classification (IPC) or both national classification and IPC H02M7/12		
Applicant DYSON TECHNOLOGY LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 10 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 20.07.2004	Date of completion of this report 05.04.2005
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Zettler, K-R Telephone No. +49 89 2399-7554 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB 03/05384

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-18 as originally filed

Claims, Numbers

1-17 as originally filed

Drawings, Sheets

1/23-23/23 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
- ☒ claims Nos. 6,17
- because:
- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 6,17 are so unclear that no meaningful opinion could be formed (*specify*):
- see separate sheet**
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos.
2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:
- ☐ the written form has not been furnished or does not comply with the Standard.
- ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-5,7-16
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-5,7-16
Industrial applicability (IA)	Yes: Claims	1-5,7-16
	No: Claims	

2. Citations and explanations

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see separate sheet

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. Referring to claims 6 and 17 and taking into account Rule 6.2(a) PCT and PCT International Preliminary Examination Guidelines Chapter III-4.10, claims shall not, except where absolutely necessary, rely, in respect of the technical features of the invention, on references to the description or drawings. In particular, they shall not rely on such references as: "as described in part ... of the description," or "as illustrated in figure ... of the drawings." Claims 6 and 17 are therefore not allowable.

Thus, the following reasoned statement (Re Item V) is restricted to the claims 1-5, and 7-16.

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2. Reference is now made to the following documents:
D1: WO 01/28083 A (DANCER PAUL ;HERRADA JOSE (FR); SEB SA (FR)) 19 April 2001 (2001-04-19)
D2: US-A-5 513 058 (HOLLENBECK ROBERT K) 30 April 1996 (1996-04-30)
D3: GEUN-HIE RIM ET AL: "A novel converter topology for switched reluctance motor drives improving efficiency and simplifying control strategy" POWER ELECTRONICS SPECIALISTS CONFERENCE, PESD '94 RECORD., 25TH ANNUAL IEEE TAIPEI, TAIWAN 20-25 JUNE 1994, NEW YORK, NY, USA, IEEE, 20 June 1994 (1994-06-20), pages 937-942, XP010121330 ISBN: 0-7803-1859-5
D4: DE 28 35 301 A (MCDONALD ELECTRIC GMBH) 23 August 1979 (1979-08-23)
D5: US-B-6 486 6441 (NEMIROW ARTHUR T) 26 November 2002 (2002-11-26)
3. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 seems not to involve an inventive step in the sense of Article 33(3) PCT.

Using as far as possible the wording of claim 1, document D1 discloses the following (references in the parenthesis refer to document D1):

A power conversion apparatus (Fig. 1) for converting power from an alternating source (Fig. 1: voltage "E") to DC (Fig. 1: the voltage " U_F " across the capacitor "C" is a DC-voltage, which results from the rectification of the AC-source "E" by using the rectifier "2"), comprising:
an input stage for receiving power from the alternating source, which input stage includes an input filter,
rectifying means for rectifying the alternating signal (Fig. 1: full-wave rectifier "2" comprising four diodes "3"),
a capacitor for storing energy from the rectified signal (Fig. 1: capacitor C),
an output (Fig. 1: the terminals of the capacitor "C" can be regarded as an output) for outputting power from the rectifying means and the capacitor to a pulsed load (Fig. 1: winding with the inductance "L" which is pulsed by switching the transistors " T_1 ", " T_2 ", " T_3 ", " T_4 " on and off; Fig. 4; p. 10),
wherein the pulsed load has at least one switched winding (Fig. 1: winding with the inductance "L") which receives power from the output (Fig. 1: the terminals of the capacitor "C" can be regarded as the output), and wherein the capacitor (Fig. 1: capacitor "C") is dimensioned such that the voltage across the capacitor falls below 15% of the nominal peak rectified voltage of the source during each cycle of the alternating source (Fig. 2 in conjunction with p. 5, l. 9-24, p. 7, l. 9-12, and l. 20-22, p. 8, l. 5-9: p. 8, l. 5-9, discloses that the normal effective value of the grid voltage is 320V, which corresponds to a nominal peak rectified voltage of 325V, if the value 320V is multiplied with the square root of 2; therefore, the maximum value of the curve of Fig. 2 represents the peak value of 325V and falls to approximately 39V; the value of 39V is round about 12% of the value of 325V; thus, 12% is a value that is below 15%).

The subject-matter of claim 1 is novel according to Art. 33(2) PCT and differs from the apparatus of document D1 in that

D1 discloses no input stage including an input filter.

As a consequence, the problem to be solved by claim 1 may therefore be regarded

as how to protect the power conversion apparatus from any spurious signals of the AC mains, as well as preventing the AC mains from unwanted signals generated by the power conversion apparatus itself.

When confronted with this problem, the skilled person would certainly look for documents that apply input filters in power conversion apparatuses in order minimize the transfer of electromagnetic interference between the AC mains and the power conversion apparatus to be supplied by this AC mains, and would find document D2.

Document D2, Fig. 1, in conjunction with col. 3, l. 49-51, discloses an EMI-filter, which is assembled between the AC line input and a power conversion apparatus to be supplied by the AC mains.

The indications provided by the prior art seem to be sufficient to prompt the skilled person, namely when the above-mentioned problem is to be solved, to insert the EMI-filter of D2, Fig. 1, in the apparatus of D1, Fig. 1, between the AC source "E" and the rectifier "2".

As a consequence, the skilled person arrives at the power conversion apparatus according to claim 1, without executing an inventive step in the sense of Art. 33(3) PCT.

4. Claims 2-5 and 7-16 are dependent claims. Since independent claim 1 is novel, dependent claims 2-5 and 7-16 are novel according to Art. 33(2) PCT, either.
5. Dependent claims 2 and 3 seem not to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step for the following reasons:

Document D1, p. 7, l. 9-12, discloses already the preferred use of a capacitor of a low capacity in order to reduce the costs, with the result that the voltage at the capacitor falls down to 12% (see argumentation for claim 1). Therefore, the reduction to the lower values 10% (claim 2) and 5% (claim 3) seems to be a simple extrapolation in a straightforward way from the known prior art document D1 (PCT International Preliminary Examination Guidelines Chapter IV-8.8, (C1)(iii)).

6. Dependent claim 4 seems not to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of inventive step for the following reasons:

P. 10, l. 1-11, in conjunction with Fig. 1 shows that after opening the switches T1 and T4, the current flows through the inductance/winding L, the diodes D2 and D3 and the capacitor. Therefore, the capacitor must be dimensioned to store the amount of energy, which is released from the winding/ inductive load when it is switched off.

7. Dependent claim 5 seems not to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of an inventive step, see document D3, and the corresponding passages cited in the search report.

Furthermore, the choice of a frequency of more than 2 kHz seems to be the result of a normal design procedure, or is obtained by routine trial and error (PCT International Preliminary Examination Guidelines Chapter IV-8.8, (C1) (ii)).

8. Dependent claim 7 seems not to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of an inventive step, because document D1, title, discloses a vacuum cleaner, which can be regarded as an electrical apparatus.
9. Dependent claim 8 seems not to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of an inventive step for the following reasons:

For obtaining a higher efficiency and therewith reduced losses of a power conversion apparatus driving a pulsed load, it should be obvious to restrict the current, and therefore the flux, in the windings/pulsed loads to these periods of time, where the corresponding flux will be required to produce the necessary pulses for the respective pulsed load. Therefore, the skilled person would certainly design the power conversion apparatus such that a flux build up is omitted as far as possible, which means that a flux is existent only, when this flux is required. Further, D1, p. 10, discloses that the increase and the decrease of the current, and therefore the flux,

can be controlled by switching on and off the respective winding/inductive load. Therefore, the adjustment of the on- and off duration of the switching of the inductive load, in a way that the on state is lower as the off state, seems to be a routine trial and error procedure, or at least the application of a normal design method, without applying an inventive step (PCT International Preliminary Examination Guidelines Chapter IV-8.8, (C1) (ii)).

10. Dependent claims 9 and 10 seem not to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of an inventive step, because D1, p. 1, l. 10-16, in conjunction with Fig. 1, discloses such a motor.
11. Dependent claims 11 to 15 seem not to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of an inventive step for the following reasons:

Document D1, p. 1, l. 10-16, together with p. 7, l. 30-33, and p. 13, l. 19-23, disclose an electronically switched motor (e.g. reluctance motor) for the use in a vacuum cleaner. The skilled person therefore would look for documents dealing with vacuum cleaners, in order to obtain hints for fabricating the vacuum cleaner, and would find document D4. D4, p. 6, in conjunction with Fig. 1 and 2, discloses an impeller 15, which is driven by the motor 14, an airflow path 21, wherein the impeller is a suction fan, a surface treating device 12, which is driven by the motor 14, wherein this surface treating device 12 itself represents an rotatable agitator. Further, the surface treating device/agitator 12 is located at the cleaner head 11.

12. Dependent claim 16 seems not to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of an inventive step for the following reasons:

Document D5, Fig. 4, discloses an electrical apparatus 20 comprising a power conversion apparatus 28, an input stage comprising an AC input and an EMI filter 32, a rectifying means 34, a capacitor 45, an output (= terminals of the capacitor 45), and a pulsed load, which is realised as a switched winding (= switched winding of the flyback transformer 36 that is connected to the switch 38).

Solving the problem of reducing the costs of the apparatus 20, the skilled person would look for documents that deal with switched loads and would find document D1.

D1, Fig. 2 in conjunction with p. 5, l. 9-24, p. 7, l. 9-12, and l. 20-22, p. 8, l. 5-9, discloses a switched load, which can be driven with a reduced capacity. According to Fig. 2 and p. 8, l. 5-9, the capacitor is dimensioned in such a way that the voltage across this capacitor falls to round about 12% of the nominal peak rectified voltage of the source during each cycle of the alternating source (see explanations for claim 1).

13. The industrial applicability in the sense of Art. 33(4) PCT is given for the claims 1-5 and 7-16.